

Joint Theater Trauma System Clinical Practice Guideline

CANINE RESUSCITATION

Original Release/Approval:	Apr 2011	Note: This CPG requires an annual review
Reviewed:	Apr 2011	Approved: 15 Apr 2011
Supersedes:	This is a new CPG and must be reviewed in its entirety	
<input type="checkbox"/> Minor Changes	(or)	<input type="checkbox"/> Changes are substantial and require a thorough reading of this CPG (or)
<input type="checkbox"/> Significant Changes		

1. **GOAL.** To provide guidance to non-veterinary surgeons in the initial resuscitation of sick or combat-injured dogs in theater.
2. **BACKGROUND.** Military Working Dogs (MWDs) represent a powerful asset to military police, Special Forces units, and others working in today's combat environment. Expectations are high that these dogs, if injured, will receive a high level of resuscitative care at the Echelon II and III, where the presence of a trained veterinarian is uncommon. Canines differ in anatomy and physiology in comparison to the injured adult human. Knowledge of key differences will assist the physician in resuscitating and stabilizing injured MWDs prior to transport to veterinary care. **Physicians should only perform medical or surgical procedures necessary to correct life-threatening issues and to prepare the MWD for MEDEVAC. Veterinary care is available at multiple locations throughout theater (see [Appendix A](#)).**
3. **KEY POINTS IN ATLS.**
 - a. Caregiver safety is paramount
 - Liberal use of muzzle, if immediate access to airway is not necessary; use roll gauze to improvise muzzle if necessary.
 - Have dog handler at patient's side if possible; otherwise, identify one person for MWD restraint.
 - b. Shave patient (prior to any lines or invasive procedures)
 - Ideally, use horse clippers with #10 blade (e.g., \$200 Oster PowerPro), or
 - Improvise with OR prep razors
 - c. **Typical weight for military working dogs is 30-40 kg.**
4. **NORMAL PARAMETERS.**

Vitals

 - Normal HR 80-120 beats/minute (Pulse: femoral or pedal; Auscultation: either side of chest, just above sternum, just behind elbow)
 - Normal BP 120/80 mm Hg
 - Normal RR 16-30 breaths/minute; panting can be normal, but can also indicate heat stress/stroke
 - Normal Rectal temperature is 99-102 F (an excited MWD may have a temperature upwards to 103 F, recheck after dog calms down).

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Labs

- Chemistry, HCT, and ABG parameters similar to humans; canine albumin values will always be falsely low using human analyzers, and cannot be used for diagnostic purposes.
- Urine output 0.5 ml/kg/hr

Other

- ETCO₂ normal < 45mm Hg

5. TUBES, LINES AND MONITORS.

- Place pulse oximeter on ear or tongue
- Place EKG leads on footpads, secure with coban
- Use pediatric-sized (neonate 5, pediatric 6-8) non-invasive blood pressure cuffs; larger cuffs tend to read abnormally low. Ensure machine is set to Pediatric settings.
- Venous access options:
 - Peripheral 18 gauge, 1.16-2 inch angiocath in extremities (cephalic or saphenous vein), secured with coban
 - Intraosseous catheter in extremities (femur or humerus), secured with coban
 - Jugular venous access (with ultrasound guidance) 18 gauge angiocath, sewn into place
 - Saphenous vein cutdown, secured with coban
 - Femoral vein cutdown, sewn into place
- FAST scan (shave or use lots of gel)
- Diagnostic Peritoneal Lavage
 - Consider in the presence of hypotension and inconclusive FAST
- Tube thoracostomy
 - Indicated for pneumothorax, tension pneumothorax and hemothorax
 - Most dogs have a fenestrated mediastinum, so bilateral chest tubes are mandated but may be indicated clinically.
 - Place dog in sterna recumbency or standing position.
 - Place them a bit lower than in a human; mid-thorax at seventh intercostal space (dogs have 13 ribs)
 - Use 28-36 F chest tubes
 - Be aware of the sharp upward curve of the diaphragm
 - Get follow-up (lateral) radiograph
- Thoracentesis:
 - Diagnostic and therapeutic
 - Clip and aseptically prepare site first and place dog in sterna recumbency.
 - 19-23g needle attached to three-way stopcock, with extension tubing and syringe
 - Place at 6th, 7th, or 8th intercostal space; mid-to upper third to remove air, lower two-thirds to remove fluid

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6. AIRWAY ISSUES / INTUBATION.

- a. Dogs are nose breathers, but often will not tolerate nasal cannulae. Either secure it to the muzzle, or use face mask instead.
- b. Preoxygenate with O₂ by face mask.
- c. Intubate in sternal recumbency (patient on its belly) with head elevated.
- d. No benefit of cricoid pressure (Sellick's maneuver).
- e. Rapid sequence induction drugs (see below).
- f. Grab tongue with gauze; pull out and to patient right side.
- g. Have assistant with light source; use of laryngoscope is highly recommended.
- h. Use cuffed 8.0, 8.5 or 9.0 ETT.
- i. If orotracheal intubation is unsuccessful, flip dog onto its back, and proceed to tracheostomy with 6.0 trach tube or 6.0 ETT. Easier than in humans due to long neck; between the 3rd and 6th tracheal rings.

Compromised Patient Protocol

Place intravenous catheter and begin resuscitative measures prior to anesthesia.

Preoxygenate for 3-5 minutes via face mask. Connect ECG leads.

Premed/induce: Hydromorphone 0.2 mg/kg, plus midazolam 0.1 mg/kg, IV. Allow 30 seconds while still oxygenating via face mask. Attempt intubation. If not possible, bolus propofol in 1mg/kg boluses to effect; can be used as sedation protocol for evacuation of canine patient.

Maintenance: Isoflurane 0.5 -1.5 %, titrated to effect. Hydromorphone as needed for intra-op analgesia, 0.1 mg/kg IV, not to exceed 0.2 mg/kg per hour.

Support: LR at 5-10 ml/kg/hr. Boluses of 20 ml/kg, as needed to restore volume. Add Hetastarch, 5 ml/kg boluses, not to exceed 20 ml/kg, if hypotension refractory to LR.

Gastric Dilatation Volvulus (GDV) cases require stabilization and gastric decompression prior to general anesthesia, and are therefore classified as compromised patients.

Isoflurane concentration necessary to keep compromised patients in a general plane of anesthesia is usually significantly lower than a normal patient.

Emergency Surgery Protocol

For use ONLY in cases that require surgery in 15 minutes or less to save the patient's life, such as airway obstruction or acute, life-threatening hemorrhage.

Stabilization prior to induction is always best:

- ☐ **Preoxygenate** via face mask. If there is an upper airway obstruction, then provide O₂ through an 18 gauge needle placed into the trachea between the tracheal rings.
- ☐ **Multiple IV access.** Restore circulating volume as needed with Hetastarch, 5 ml/kg, followed by LRS to a MAP=60 mm Hg.

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Premedication/Induction/Maintenance/Support: Use Compromised Patient Protocol.

True emergencies requiring immediate anesthesia are RARE. Most patients will have a better outcome if stabilized before anesthesia or surgery. GDV cases require stabilization and decompression prior to general anesthesia. They do not meet the definition of “emergency” as used in this protocol. Critically ill patients may be slow to recover from anesthesia. Monitor and document all vital signs frequently and provide supportive care as necessary.

7. RESUSCITATION FLUIDS.

- a. Shock dose (NS or LR) is 90 ml/kg in first hour, given in ¼ dose increments based upon patient’s response
- b. Fluid boluses 10-20 ml/kg with crystalloid (NS or LR)
- c. Hetastarch 5 ml/kg bolus; maximum dose of 20/ml/kg/day
- d. Fluid support under anesthesia 10 ml/kg/hr (NS or LR)
- e. Maintenance rate 2-5ml/kg/hr (NS or LR)
- f. Human Serum Albumin is NOT recommended
- g. Cannot administer human PRBC’s, FFP, or whole blood to dogs
- h. Consider auto-transfusion from chest tubes
- i. Oxyglobin (hemoglobin-based oxygen carrier, derived from cow’s blood) 10-20 ml/kg bolus
- j. Do not use recombinant Factor VII without advice and consult from U.S. military veterinarian

8. STATUS EPILEPTICUS.

Seizure activity lasting 30 minutes, or two or more seizures without full inter-ictal recovery. Causes include electrolyte abnormalities (hypoglycemia, hyponatremia), poisoning, head trauma.

- a. Establish IV access.
- b. Give anti-convulsant medications:
 - 1) Diazepam (Valium) 0.5-1mg/kg IV or 1-2 mg/kg PR, effect in 2-3 minutes
or
 - 2) Midazolam (Versed) 0.25mg/kg IV bolus then drip 0.3 mg/kg/hr in NS IV
or
 - 3) For refractory status epilepticus: Propofol 1-3mg/kg IV bolus then 6-18 mg/kg/hr (100-300 mcg/kg/min).
- c. Maintain airway, supplemental O₂, intubate if necessary; intubation is mandatory with propofol as it causes profound apnea in dogs.
- d. Monitor core body temperature to avoid hyperthermia. Cool down with icepacks to groin and axillae to 103 F or 39.4 C.
- e. Evacuate to veterinary care.

9. GASTRIC DILATATION & VOLVULUS (GDV), aka “Bloat”

- a. Clinical Signs: Gastric distension, non-productive vomiting (retching, excessive salivation), abdominal pain (grunting, pacing, excessive panting, inability to get comfortable when lying down)

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- b. Complications: SHOCK, collapse, cardiac arrhythmias, gastric rupture, splenic avulsion/rupture, DIC, death
- c. Radiograph: Right lateral recumbency: severe gas distention, pylorus displaced dorsally
- d. Treatment:
 - **TREAT SHOCK FIRST**
 - Decompress stomach second:
 - o 16g over-the-needle catheter as trocar, percuss abdomen for area of greatest tympanic resonance, mark trocar insertion site two finger-widths behind last rib, over area of greatest resonance
 - o Shave and aseptically prepare area
 - o Gently but firmly insert trocar through skin, abdominal wall and stomach wall; success = gas/air escape through trocar, may get small amount bile stained fluid
 - o Attach 3-way stopcock and 60-cc syringe, aspirate air repeatedly
 - o Remove catheter once air can no longer be removed
 - o If unable to successfully decompress stomach consult veterinarian prior to performing laparotomy
 - Surgically detorse volvulus via laparotomy once initial decompression is complete (consult veterinarian prior to performing laparotomy)
 - Evacuate to veterinary care as soon as medically feasible

10. HEAT INJURY.

- a. Sustained core temperature ≥ 106 F; body temperature can increase with stress and exercise, but should return to < 104 F within 15 minutes in otherwise healthy dog
- b. Clinical Signs: Collapse, seizure, GI distress/diarrhea, clotting disorders, death
- c. Treatment:
 - Move dog to cool, quiet area with fan or other source of air movement
 - Evaporative cooling to 103 F, then stop: wet whole body with cool (not cold) water, ice packs to axillae and groin, room temperature IV fluids

11. BLAST INJURY.

- a. Clinical Signs: related to primary blast (shrapnel, etc) and secondary shock wave: respiratory distress (often progressive), GI (vomiting, diarrhea, abdominal pain), neurologic (seizures, head tilt, ataxia, depression), renal (hematuria, may progress to anuria)
- b. Treatment: ABCs, treat for SHOCK and seizures if present, administer oxygen via face mask, evacuate to veterinary care

12. BANDAGING OF EXTREMITIES.

- a. Leave middle two toes exposed for assessment of circulation and swelling
- b. Pad pressure points around joints
- c. Immobilize fractures one joint above and one joint below injury using a SAM splint or equivalent on the caudal aspect of the limb; consult veterinarian before considering application of casting materials

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Approved by CENTCOM JTTS Director, JTS Director
and Deputy Director and CENTCOM SG

Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the Services or DoD.
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APPENDIX A

Premedication:	
Hydromorphone	0.05-0.2mg/kg IV, IM or SQ
<i>or</i>	
Fentanyl	2-5 mcg/kg IV with or w/o Midazolam 0.2 mg/kg IV/IM
Induction:	
Etomidate	1mg/kg IV, give Midazolam 0.2 mg/kg (5 mg max) IV 5 minutes prior
<i>or</i>	
Ketamine	5 mg/kg IV with Midazolam (Versed) 0.28/kg IV
<i>or</i>	
Propofol	4-6 mg/kg

MORE ANESTHESIA DRUGS

Anesthetic	
Isoflurane	0.5-3% in 2.0 L O ₂ (MAC = 1.5%)
Propofol drip	60 mcg/kg/min IV
Sedation	
Diazepam	0.2 – 0.6mg/kg IV
Ketamine w/ Midazolam (Versed)	5 mg/kg Ketamine + 0.28 mg/kg Midazolam IM

OTHER CANINE-DOSED DRUGS

ICU Pain medications	
Morphine *	.25-2 mg/kg IM or SQ every 4h
Hydromorphone* (Dilaudid)	0.2 mg/kg IM, IV or SQ q2-6 hrs
*Caution: Dogs are prone to nausea/emesis and defecation within minutes of drug administration.	
Fentanyl	5-10 mcg/kg IV
Fentanyl drip	2-5 mcg/kg/hr IV
Morphine drip	0.05 – 0.2 mg/kg/hr IV
** DO NOT administer ANY human-labeled NSAID to dogs; toxicity will likely result.	
Antiemetics	
Ondansetron (Zofran)	0.1 – 0.2 mg/kg IV slowly q 6-12hrs
Antibiotics	
Cefazolin (Ancef)	22mg/kg IV q6-8h
Ampicillin	22 mg/kg IV q6-8 h

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Pressors	
Dopamine	1-3 mcg/kg/min IV
Phenylephrine (Neo-Synephrine)	1-3 mcg/kg/min IV
Epinephrine drip	0.05 -0.4 mcg/kg/min IV
Avoid dobutamine as pressor agent in small animals because of B2 receptor-mediated vasodilation.	
Other drugs	
Atropine	0.02-0.04 mg/kg IV, IM, or SQ
Epinephrine (1:1000)	0.01 mg/kg IV or up to 0.1 mg/kg IT
Glycopyrrolate	0.005-0.01 mg/kg IV, IM or SQ
Lidocaine (w/o Epi) for ventricular dysrhythmias	25-75 mcg/kg/minute IV

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APPENDIX B

ADDITIONAL INFORMATION REGARDING OFF-LABEL USES IN CPGs

A. Purpose.

The purpose of this Appendix is to ensure an understanding of DoD policy and practice regarding inclusion in CPGs of “off-label” uses of U.S. Food and Drug Administration (FDA)–approved products. This applies to off-label uses with patients who are armed forces members.

B. Background.

Unapproved (i.e., “off-label”) uses of FDA-approved products are extremely common in American medicine and are usually not subject to any special regulations. However, under Federal law, in some circumstances, unapproved uses of approved drugs are subject to FDA regulations governing “investigational new drugs.” These circumstances include such uses as part of clinical trials, and in the military context, command required, unapproved uses. Some command requested unapproved uses may also be subject to special regulations.

C. Additional Information Regarding Off-Label Uses in CPGs.

The inclusion in CPGs of off-label uses is not a clinical trial, nor is it a command request or requirement. Further, it does not imply that the Military Health System requires that use by DoD health care practitioners or considers it to be the “standard of care.” Rather, the inclusion in CPGs of off-label uses is to inform the clinical judgment of the responsible health care practitioner by providing information regarding potential risks and benefits of treatment alternatives. The decision is for the clinical judgment of the responsible health care practitioner within the practitioner-patient relationship.

D. Additional Procedures.

1. Balanced Discussion. Consistent with this purpose, CPG discussions of off-label uses specifically state that they are uses not approved by the FDA. Further, such discussions are balanced in the presentation of appropriate clinical study data, including any such data that suggest caution in the use of the product and specifically including any FDA-issued warnings.

2. Quality Assurance Monitoring. With respect to such off-label uses, DoD procedure is to maintain a regular system of quality assurance monitoring of outcomes and known potential adverse events. For this reason, the importance of accurate clinical records is underscored.

3. Information to Patients. Good clinical practice includes the provision of appropriate information to patients. Each CPG discussing an unusual off-label use will address the issue of information to patients. When practicable, consideration will be given to including in an appendix an appropriate information sheet for distribution to patients, whether before or after use of the product. Information to patients should address in plain language: a) that the use is not approved by the FDA; b) the reasons why a DoD health care practitioner would decide to use the product for this purpose; and c) the potential risks associated with such use.

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